SURE PASS IN CHEMISTRY FOR - 11th STANDARD   (2 ; 3   & 5 MARKS)

UNIT –I   CHEMICAL CALCULATIONS

1.Define Molarity (M)

Molarity of a solution is defined as the number of gram-moles of solute dissolved in 1 litre of a solution

$$\text{Molarity} = \frac{\text{No. of moles of solute}}{\text{Volume of Solution in litres}}$$

2.**Define Mole fraction**

Mole fraction is the ratio of number of moles of one component (Solute or Solvent) to the total number of moles of all the components (Solute and Solvent) present in the Solution.

$$X_A + X_B = \frac{n_A}{n_A+n_B}+\frac{n_B}{n_A+n_B} = \frac{n_A+n_B}{n_A+n_B}$$
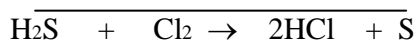
3.Define oxidation and reduction

Oxidation is a process of addition of oxygen (or) removal of hydrogen.

Reduction is a process of removal of oxygen (or) addition of hydrogen.

Example

Reaction of Cl_2 and H_2S

Oxidation

$$\overline{H_2S \quad + \quad \underline{Cl_2} \rightarrow \quad 2HCl \quad + S}$$

Reduction

4.Define Electronic concept of oxidation and Reduction

In chemical reaction loses one or more electrons. Results in the increase of positive charge example.

$Fe^{2+} \rightarrow Fe^{3+} + e^-$ [Increase of positive charge]

In chemical reaction gains one (or) more electrons. Result in the decrease of positive charge charge of the species. Š $Fe^{3+} + e^- \rightarrow Fe^{2+}$ [Decrease of positive charges]

5.Define Avogadro number (NA) :

The number of atoms in a 12-g sample of carbon - 12 is called Avogadro's number (to which we give the symbol NA). The value is 6.023×10^{23}.

6.Define Redox reaction :   A reaction which involves both oxidation and reduction.

7.Define Normality ?

Normality (N) : It is the number of gram equivalents of a solute present in one litre of the solution.

8. Define Mole. The mole may be defined as the amount of the substance that contains as many specified elementary particles as the number of atoms in 12g of carbon - 12 isotope. One mole = 6.023×10^{23} particles.

9. What is Stoichiometry?

   (i) Stoichiometry is the calculation of the quantities of reactants and products involved in the chemical reaction.
     (ii) It is the study of the relationship between the number of moles of the reactants and products of a chemical reaction.

2.GENERAL INTRODUCTION TO METALLURGY

1.Define Metallurgy : The process of extracting a metal from its principal source economically and profitably is known as metallurgy.

2.Mineral : The naturally occuring compound of a metal is known as mineral.

3.What is Ore : A mineral from which the metal can be extracted profitably in pure state is called as ore.

4.What is Gangue (matrix) : The earthly impurities associated with the mineral or ore is known as gangue.

5. what is Purification of the ore : Removal of the gangue or earthly impurities from the powdered ore is also known as concentration of the ore or ore dressing.

6.What is Roasting : It is an oxidation process where the ore is converted into its oxide.

7.Define Calcination : It is the process in which the ore is heated to a high temperature in the absence of air below its melting point. This is carried out in the case of carbonate ore and hydrated ore.

8.Define Smelting : It is a reduction method where the metal oxide is converted into metal.

9.Define Refining : The purification of the metal obtained after the mettallurgical operations is known as refining.

10. Distinguish between ore and mineral with suitable example.

S.No.	Ore	Mineral
1.	The mineral from which the metal can be readily and profitably extracted is known as ore	The natural material in which the metal and their compounds occur in earth is known as mineral.
2.	All ores are minerals	All minerals are not ores.
3.	Ex. Bauxite is an ore of aluminium.	Clay is a mineral

11. What are the different methods of concentration of ores?
   (i) Hydraulic washing or gravity separation
   (ii) Froth flotation
   (iii) Electromagnetic separation
   (iv) Chemical method. .
12. Name the ores which are concentrated by froth floatation process.

Zinc blende (ZnS) and Copper Pyrites (CuFeS2).

13. Define froth flotation process
*Sulphide are partiles are only moistened by oil oxide, gangure are only moistened by water by using oil separate the ore from impunities.
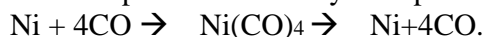
* Pine oil used as foaming agent.

14. Explain mond's process.
* Impure metal heated with CO.
* Carbonyl compound is formed.
* Decomposed the carbonyl compound get pure metal.
$Ni + 4CO \rightarrow Ni(CO)_4 \rightarrow Ni+4CO$.

15. What is meant by Anode mud.
* The insoluble impurities either dissolved in Electrolyte (or) fall at the bottom is called anode mud.

3. ATOMIC STRUCTURE - I

1.Define Atoms : The smallest chemically indivisible particles of matter.

2.What is the charge of anelectron ,proton and neutron ?
Electron : A **negatively charged** particle, which is moving around the nucleus of the atom.
Proton : A **positively charged** particle which is present inside the nucleus of the atom.
Neutron : A **neutral particle**, which is present in the nucleus, having the mass equal to that of a proton.

3.Define Mass number (A) : The total number of **protons and neutrons** (nucleons) present in the nucleus.

4.What is Atomic number (Z) : The number of **protons or** the number of **electrons** present in the nucleus.

5.What is Zeeman effect?
The **splitting up of spectral lines** in the presence of a **magnetic field** is known as Zeeman effect.

6. What is Stark effect?
The **splitting up of spectral lines** in the presence of **an electric field** is known as Stark effect.

7.what is Quantum numbers :
* The quantum numbers required to locate an electron in an atom.
* These are a set of values, which describe energy size, shape and orientation of the orbital in space.

8.State Pauli's Exclusion principle :
It is impossible for any two electrons in a given atom to have all the four quantum numbers identical.

9. State Aufbau principle :
In the ground state of the atoms, the orbitals are filled in order of their increasing energies.

10.State Hund's Rule : No pairing occurs until all orbitals of a given sub-level are half filled.

11. What is the maximum number of electrons that an orbital can have?
The maximum number of electrons an orbital can accommodate is $2(2l+1)$

12. What is the total number of orbitals associated with the principal quantum number n=3 ?
For n = 3, the possible values of l are 0,1 and 2. Thus, there is one 3s orbital (n = 3, l = 0 and ml = 0); there are three p orbitals (n = 3, l = 1 and ml = −1, 0, 1) there are five 3d orbitals (n = 3, l = 2, m = −2, −1, 0, 1, 2). Therefore, the total number of orbitals is 1+3+5 = 9.

13. What is defect of Rutherford model
* Failed to explain stability of atom.
* Failed to explain existence of certain definite lines in hydrogen spectrum.

4.PERIODIC CLASSIFICATION - I

1.DefineTriad : A group of three elements having similar properties.

2. State Dobereiner's law of triads :
  When elements are arranged in the order of increasing atomic mass in a triad, the atomic mass of the middle element is approximately equal to the arithmetic mean of the other two elements.

3.State Newlands law of Octaves :
     If the elements were arranged in order of their increasing atomic weights, the eighth element starting from a given one, possessed properties similar to the first, like the eighth note in an octave of music.

4.State Lother Meyer's Arrangement : When a plot of **atomic volumes** versus **atomic weights** of elements were plotted, a curve was obtained. Lother Meyer pointed out that elements occupying similar positions in the curve possessed similar properties.

5.What is Mendeleev's Periodic law :
 The properties of the elements are the periodic function of their **atomic weights".**

6.State Modern Periodic Law :
The physical and chemical properties of the elements are periodic function of their **atomic numbers.**

7.What is Representative Elements :
Elements belonging **to 's' and 'p' block elements** together are known as representative or main group elements.

8.What is Isoelectronic :
 Atoms or ions which contains the **same number of electrons** are said to be isoelectronic. EX. O^{2-}, F^-.

9.Define Ionisation energy (Ionisation enthalpy) : The energy required to **remove the most loosely bound electron** from an isolated gaseous atom is known as ionisation enthalpy.

10.What is Electron affinity (Electron gain enthalpy) : It is the amount of energy released when an isolated gaseous atom **accepts an electron** to form a mono valent gaseous anion.

11.What is Electronegativity :
It is the tendency of an atom **in a molecule to attract the shared pair of electrons towards** itself.

12. Arrange F, Cl, Br and I in the order of increasing electronic gain enthalpy.
                         I < Br < F < Cl
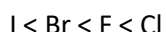
13. Why Noble gases have zero electron gain enthalpy?
In the case of noble gases, the **outer s-and p-orbitals are completely filled**. No more electrons can be accommodated in these orbitals. Noble gases, therefore, show no tendency to accept electrons. Their electron gain enthalpies are zero.

14. Why do elements in the same group have generally similar properties?

Elements in the same vertical column or group have similar electronic configurations, have the same number of electrons in the outer orbitals, and similar properties. Group 1 is an example.

15. Arrange the order of increasing atomic volumes in : (a) Li, Na and K; (b) C, N and O; (c) Ca, Sr and Ba.   ANSWERS - (a) Li, Na, K; (b) O, N, C; (c) Ca, Sr, B

16.Describe s,p,d and f block elements
S – Block Elements
* First Group element (alkali) 2_{nd} group element (alkaline earthmetal).
* Out most electronic configuration nS^1 and nS^2
P – Block Elements
* It contain from 13_{th} group to 18_{th} group
* outer most electronic configuration $nS^2 nP^1$ to $nS^2 nP^6$
d – Block Elements
* Its outermost electronic configuration $(n-1) d^{1-10} ns^{1-2}$
The *e*lectrons filled in d orbital
* It contain from 3_{rd} group to 12_{th} group.
f – Block Elements
* It contain Lanthanoids and actinoids.
* Its outermost electronic configuration $(n-2)f^{1-14} (n-1) d^{0-10} ns^2$.
* The e- are filled in f orbital

17. Define metalloids
* Periodic table show properties that are characteristic of both metals and non – metal.
* These elements are called semi – metals (or) metalloids.

18.Write any 3 difference between electron gain enthalphy and electro negativity

S.NO	Electron gain enthalphy(Electron affinity)	Electro negativity
1.	The amount of energy released when an isolated gaseous atom **accepts an electron** to form a mono valent gaseous anion	The tendency of an atom **in a molecule to attract the shared pair of electrons towards** itself.
2.	Unit KJ / mole Kcal / mole	No units
3.	It does not change regulary in a period (or) group	It changes regulary in a period (or) a group

5. GROUP 1 S -BLOCK ELEMENTS

1.What are isotopes ?Mention the isotopes of hydrogen
 Protium : Common form of hydrogen. Atomic number = 1 and Mass number = 1.

Deuterium (heavy hydrogen) : An isotope of hydrogen with mass number 2 and atomic number 1.

Tritium : Another isotope of hydrogen with mass number 3 and atomic number 1.

2.What is Orthohydrogen and Para hydrogen ?

Ortho hydrogen: If the **protons in the nuclei** of both hydrogen atoms in a hydrogen molecule **spin in the same direction**, it is known as ortho hydrogen.

Para hydrogen : If the **protons in the nuclei** of both hydrogen atoms in a hydrogen molecule **spin in opposite direction,** it is termed as para hydrogen.

3. Write a short note on tritium.

   Tritium, $_1H^3$ or $_1T^3$: It occurs in the upper atmosphere only where it is continuously formed by nuclear reactions induced by cosmic rays. Unlike deuterium, it is radioactive, with a **half-life of ~ 12.3** years. It's nucleus consists of **one proton and two neutrons**.

4. How does deuterium react with nitrogen?
Reaction with nitrogen: Like hydrogen, it combines with nitrogen in the presence of a catalyst to form heavy ammonia or deutero ammonia. $3D_2 + N_2 \rightarrow 2ND_3$
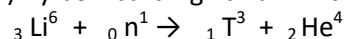
5. How does deuterium react with metals?
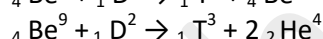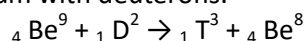 Deuterium reacts with alkali metals at high temperatures (633 K) to form deuterides.

$$2Na + D2 \rightarrow 2NaD$$
$$NaD + H2 O \rightarrow NaOH + HD.$$
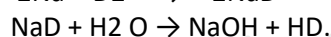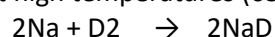
6. How is tritium prepared?
   Tritium is prepared by (i) By bombarding lithium with slow neutrons.

$$_3Li^6 + _0n^1 \rightarrow _1T^3 + _2He^4$$

(ii) By bombarding beryllium with deuterons.

$$_4Be^9 + _1D^2 \rightarrow _1T^3 + _4Be^8$$
$$_4Be^9 + _1D^2 \rightarrow _1T^3 + 2\, _2He^4$$
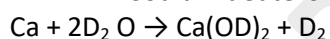
7. How does heavy water react with metals?
   D_2O reacts slowly with alkali and alkaline earth metals liberating heavy hydrogen.
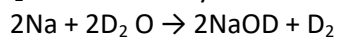
   $2Na + 2D_2 O \rightarrow 2NaOD + D_2$
                Sodium deuteroxide
   $Ca + 2D_2 O \rightarrow Ca(OD)_2 + D_2$
                Calcium deuteroxide

8. How is hydrogen peroxide prepared in the laboratory?
 By the action of dilute sulphuric acid on sodium peroxide, calculated quantity of Na_2O_2 is added in small proportions to a 20% ice cold solution of sulphuric acid.
 $Na_2O_2 + dil\, H_2SO_4 \rightarrow Na_2SO_4 + H_2O_2$ 30% solution of H_2O_2 is obtained by this process.

9. How do you convert para hydrogen to ortho hydrogen?
 Ortho hydrogen is more stable than para hydrogen. The para form is transformed into ortho form by the following methods. (i) By treatment with catalysts like platinum or iron.
                  (ii) By passing an electric discharge.
                  (iii) By heating to 800°C or more.
                  (iv) By mixing with paramagnetic molecules like O_2 , NO, NO_2 .
                  (v) By mixing with nascent hydrogen or atomic hydrogen.

10. Mention two important uses of H_2O_2 .
         (i) It is used as an **antiseptic and germicide** for washing wounds, teeth and ears.
        (ii) It is used in bleaching delicate things like hair, wool, silk, ivory and feathers.
        (iii) It is used as an oxidizing agent.
        (iv) It is also used as a propellant in rockets.

11. Why alkali metals have low melting and boiling points?

All alkali metals have low melting and boiling point due **to the weak bonding in the crystal lattice**. Melting and boiling points decreases on moving down the group from Li to Cs.

12.Explain the characteristics properties of alkali metals.

(i) Shiny, white and soft.

(ii) Readily cut with a knife.

(iii) They are extremely reactive metals and form strong alkaline oxides and hydroxides.

(iv) The last metal of this group, francium is radioactive.

(v) All the alkali metals exhibit an oxidation state of +1.

(vi)The alkali metals give characteristic colour in bunsen flame.

6.2S block elements

1.Write short note on Diagonal relationship Be and Al:

Be and Al which are diagonally opposite to each other in the periodic table **exhibit similarities in their properties**. This is known as diagonal relationship. This is due to their similarity in their size and high electronegativity.

2. CaO (Calcium oxide)-quick lime : A white porous solid, readily dissolves in water, producing heat. The calcium hydroxide formed is known as slaked lime.

3.What is Lime water?

The paste of lime $Ca(OH)_2$ in water is called milk of lime. While the filtered and clear solution is known as lime water.

4.Write short note on Plaster of Paris

On heating gypsum $CaSO_4$ $2H_2O$, it loss 1½ molecules of water, forming $CaSO_4$ ½H_2O (Calcium sulphate hemihydrate). This substance is known as plaster of paris.

Uses:-

* In surgery for plastering the fractured bones

* In making moulds for statues

* In making false ceilings

5.What is Inert pair effect : As we go down the group, the **two electrons present in the 's' orbital become inert**, and the electrons in the **'p' orbital are involved in chemical reactions**. This is known as inert pair effect.

6. What are the ore of magnesium in nature

1. Magnesite $MgCO_3$ 2. Dolomite $MgCO_3$, $CaCO_3$

3. Epsom salt $MgSO_4$, $7H_2O$ 4. Carnalite $MgCl_2$ $KCl.6H_2O$

7. What is meant by Epsom salt . How it is prepared

*   It is magnesium sulphate $MgSO_4$ $7H_2O$

* $MgO + H2SO4 \rightarrow MgSO4 + H2O$

8. Give the uses of epsum salt**.**

* Used as purgative

* Used in dyeing and tanning process

* Platinised MgSO4 used as catalyst.

9. Give the properties of quick lime.

* With Cl_2 give bleaching powder $CaOCl_2 \cdot H_2O$
* White porous solid
* With CO_2 form $CaCO_3$
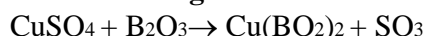* With SO_2 form calcium sulphite

7.P block elements

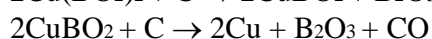1. Write short note on Borax Bead test :

A pinch of borax is heated in a platinum loop, it melts to give a colourless glassy bead. It is then dipped in a coloured metallic salt solution and again heated. Characteristic coloured beads are formed. From the colour of the beads, the basic radicals are identified. Due to the formation of metallic metaborate, the characteristic colours are formed.

Example: Copper salts give blue beads

In an oxidising flame

$CuSO_4 + B_2O_3 \rightarrow Cu(BO_2)_2 + SO_3$

In a reducing flame

$2Cu(BO_2)_2 + C \rightarrow 2CuBO_2 + B_2O_3 + CO$

$2CuBO_2 + C \rightarrow 2Cu + B_2O_3 + CO$

Borax bead test is used to identify the coloured salts.

Metallic compounds	Colour in oxidising flame	Colour in reducing flame
Copper	Blue	Red
Iron	Yellow	Bottle green
Manganese	Pinkish violet	Colourless
Cobalt	Blue	Blue
Chromium	Green	Green
Nickel	Brown	Grey

2. What is meant by borax.

* Sodium tetra borate $Na_2B_4O_7$
* Tincal a crude form of borax contain 55% of it and is found in the land dried up lakes of Tibet.

3. Give the uses of borax?

* Food preservative.
* Manufacture of glass, soap.
* Cleaning and dyeing agent in tanneries.

4. Give the structure of Diamond.

* In diamond C – C linkage are covalent

* Each corn atom linked with four neighboring carbon atom.* Tetrahedral arrangement of atom.
* High Melting Point and Boiling Point.

5. What are the allotropic forms of carbon?
* Diamond
* Graphite
* Amorphous carbon Example:- Coke, Bone black, Carbon Black

6. Explain important point of fullerens?
* Most symmetrical family.
* Contain 60 atoms and 32 sides.
* (20 hexagone and 12 pentagones)
* The group of spherical carbon.
* It has super conducting properties.

7. Give uses of carbon and its compound?
* Used as fossil fuels.
* Refrigerants, fire extinguishers.
* Make viscose rayon and cellophane.

8. Give the importance of oxygen
* It is used for resipiration by both animals and plants
* It is essential for life
* Hence molecular oxygen act as cell fuel

9. Give the uses of ozone.
* It is used as germicide and disinfectant
* It is used as Bleaching oil, starch etc
* It is used to manufacture of artificial silk and synthetic camphor.

8.THE SOLID STATE – I

1. What is meant by 'unit cell' in crystallography?
   The smallest structure of which the crystalline solid (or crystal) is built by its repetition in three dimensions is called as unit cell.

2. How many types of cubic unit cell exits?
   Three types of cubic unit cell exists. They are (i) Simple cubic (ii) Body-centred cubic and (iii) Face-centred cubic.

3. What are Miller Indices?
   The reciprocals of Weiss indices and multiplying throughout by the smallest number in order to make all reciprocals as integers obtain the Miller indices of a plane.

4. How many types of unit cell exist?
   There are seven classes of unit cells. (i) Cubic (ii) Triclinic (iii) Monoclinic (iv) Orthorhombic (v) Tetragonal (vi) Hexagonal and (vii) Rhombohedral.

5. Define crystalline solids amorphous solid.
* Atoms are arranged in regular
* Three dimensional pattern
* Rigid in compressible
Amorphous solid

* No regular arrament
* Have no definite geometrical forms
* Imcompressible to certain extent

6.What are the characteristic parameter of unit cell?
* **Crystallographic axes**.
* The lines drawn parallel to the lines of intersection of any three faces of the unit cell
* Donot lie in same plane
* **Interfacial angles**:-
* The angles between the three crystallographic axes.
* **Primitives**:- The three side a, b, c of unit cell.

7.How many number of unit cell canbe shared by body, face, edge, corner.
* Body center atom shared by one unit cell
* Face center atom shared by six unit cell
* Edge center atom shared by Twelve unit cell
* Corner atom shared by eight unit cell.

8. How to calculate the number of Na and Cl in NaCl unit cell.
$N_{ed}/4 + N_b/1 + N_f/2 + N_c/8$
$12 \times 14 + 1 \times 1 = 3 + 1 = 4$ sodium ion for chloride ions
$8 \times (1/8) + 6 \times (1/2) = 1 + 3 = 4$ chloride

9.GASEOUS STATE – I

1.Define Boyle's law :   At constant temperature, the pressure of given mass of a gas is inversely proportional to its volume.
   ie., $P \propto 1/V$ at constant temperature. PV = constant or $P_1 V_1 = P_2 V_2$ Š

2.Give Vander Waal's constants in terms of critical constants.
   (i) $P_c = a /27 b^2$ (*Pc* -Critical Pressure)
* The minimum pressure is required to liquefy 1 mole of gas at critical temperature.
   (ii) $T_c = 8a/27 Rb$ *Tc* (Critical Temperature)
* At particular temperature when increase the in pressure brings in liquefaction occurs.
* Above which no liquefaction occur although the pressure increased.
   (iii) $V_c = 3b$ *Vc* (Critical Volume)
* 1 mole of gas occupied volume at T_c and P_c

3.Define Joule-Thomson effect :
The phenomenon of producing lowering of temperature **when a gas is made to expand adiabatically from a region of high pressure into a region of low pressure** is known as Joule-Thomson effect.

4.What is Inversion temperature :   The temperature below which a **gas expands adiabatically into a region of low pressure through a porous plug with a fall in temperature** is called as inversion temperature (Ti). $T_c = 8a/27 Rb$

5.What is Linde's method and claude's process :
Linde's method : It is a method of liquefaction of gas using the principle of Joule-Thomson effect.
Claude's process : In this method, compressed air is allowed to do mechanical work of expansion, which is done at the expense of kinetic energy of the gas. Hence a fall in temperature is observed. This principle is combined with Joule-Thomson effect and used in the liquefaction of air.

6.What is Adiabatic demagnetisation : When a magnetic substance is suddenly demagnetised under adiabatic conditions, a fall in temperature is noticed. By this technique, the temperature as low as zero kelvin can be reached

7. Write the significance of Vanderwaal's constants.

(i) The term a/V^2 is the measure of the attractive forces of the molecules. It is also called as the cohesion pressure (or) internal pressure.

(ii) The inversion temperature of a gas can be expressed in terms of 'a' and 'b' $T_i = 2a/Rb$

(iii) The Vanderwaal's constants 'a' and 'b' enable the calculation of critical constants of a gas.

8. Write the limitations of Vanderwaal equation of state.
 (i) It **could not explain the quantitative aspect of deviation** satisfactorily as it could explain the qualitative aspects of P and V deviations.
 (ii) The **values of 'a' and 'b' are also found to vary with P and T**, and such variations are not considered in the derivation of Vanderwaal's equation.
 (iii) Critical constants calculated from **Vanderwaal's equation deviate from the original values** determined by other experiments.

9.What are the condition of liquefication of gas.
* Based on concept of critical temperature followed by compression.
* Based on Joule Thomson effect
* Adiabatic demagnetization.

10. Define Dalton's law of partial pressure.
At constant temperature, the total pressure exerted by the gaseous mixture is equal to the sum of the individual pressures which each gas would exert if it occupies the same volume of mixture fully by itself.

11. How to derive the ideal gas equation
Boyles law $P \propto 1/V$ (At constant T)………….. (1)
Charles law $P \propto T$ (At constant V)………….. (2)
Combine **1** and **2** equation
$P \propto T/V$ (or) $PV \propto T$
    $\therefore PV = RT$
R – is proportionality constant
Idea gas equation
PV = nRT 'n' number of moles of gas

10.CHEMICAL BONDING
1.What are the different types of Chemical bonding :
 There are various types of bonds (i) ionic bond (ii) covalent bond (iii) coordinate covalent bond.

2. The shape and geometry of the covalent bond is explained by (i) Valence Shell Electron Pair Repulsion Theory (VSEPR Theory) and (ii) Valence Bond Theory

3. Discuss the important properties of electrovalent compounds.
 (i) They have **high** melting and boiling points.

(ii) They are **poor conductors** in the solid state but their **aqueous solutions conduct electricity**.

(iii)They **exist only as ions packed** in a definite three dimensional manner.

(iv) They are **soluble in polar solvents like H_2O and insoluble in non polar solvents** like benzene.

(v) Electrovalent compounds having the same electronic configuration **exhibit isomorphism**.

4. Explain the important properties of covalent compounds.

(i) These compounds exist as **neutral molecules** and not as ions.

(ii) They **do not conduct electricity in fused or molten state**.

(iii) They possess **low** melting and boiling points.

(iv) They possess **definite geometry.**

(v) They **are soluble in non polar solvents** and insoluble in polar solvents.

4. Discuss the partial covalent character in ionic compounds using Fajan's rule.

   The phenomenon of deformation of anion by a cation is known as polarisation. Greater, the extent of polarisation of the anion by the cation, greater is the covalent character.

5. Explain about ionic bond and covalent bond

* The electrostatic attraction between positive and negative ions.

Excises:- NaCl

Covalent bond

* Mutal sharing of electron between bonded atom Ex:H_2 Co-ordinate covalent bond (or) dative bond.

* The bond thus formed is between the dorar and acceptor atom Ex: NH_3

6.Define Hess's law.

* Enthalphy change of reaction same at constant V and P whether it takes place in single (or) multiple step.

* The initial reactants and final products are same.

7. What are the important features of lattice enthalphy ?.

* More stable ionic compound have greater lattice enthalphy.

* Higher charge and smaller radii ion have greater lattice enthalphy

* Lattice enthalphy attest the solubilities of ionic compound.

8.Define Hybridisation.

Same energy of atomic orbitals combines to form equal number of hybrid orbitals. With same energy, shape etc. The phenomenon is hybridization

11.COLLIGATIVE PROPERTIES

1. What are colligative properties?

   Colligative properties are the **properties** of dilute solutions **which depend only on the number of solute particles and not on their chemical nature.**

2. Define relative lowering of vapour pressure.

The ratio between the lowering of vapour pressure (p° – p) to the vapour pressure of the pure solvent (p°) is known as the relative lowering of vapour pressure.

3.Define **Raoult's Law**

         At constant temperature the vapour pressure of the solution (p) is directly proportional to the molefraction of the solvent (X_1) present in the solution. That is,   **p = p° X_1**

4. What is Boyle's - Vant Hoff law and Charle's - Vant Hoff law

Boyle's - Vant Hoff law **: $\pi \ \alpha$ C at constant T } π = CRT (R gas constant)**

Charle's - Vant Hoff law **: $\pi \ \alpha$ T at constant C }**

5. Define Van't Hoff factor(i) (Abnormal collgative properties)

$$i \ = \ \frac{\text{Experimental colligative property}}{\text{Normal colligative property}}$$

6. What are the colligative properties.
* Lowering of vapour pressure of solvent (ΔP)
* Elevation of Boiling point of solvent (ΔT_b)
* Depression of freezing point of solvent (ΔT_f)
* Osmotic pressure (π)

12. THERMODYNAMICS – I

1.What are Homogeneous system and Heterogeneous system.
Homogeneous system : If the **physical states of all the matter is uniform throughout the system**, it is known as homogeneous system.
Heterogeneous system : If the **physical state of all the matter is not uniform throughout the system**, it is known as heterogeneous system.

2.What is Intensive properties : The properties that are **independent of the mass or size** of the system are known as intensive properties. eg. **refractive index, surface tension, density**, **temperature, boiling point, freezing point** etc.

3.What is Extensive properties : The properties that **depend on the mass or size of the system** are known as extensive properties. eg., **Volume, number of moles, mass, energy, internal energy** etc.

 4. Define zeroth law of thermodynamics.
   If two systems at different temperatures are separately in thermal equilibrium with a third one, then they tend to be in thermal equilibrium with themselves.

5. Give the relation between ΔU and ΔH.   **$\Delta H = \Delta U + P \Delta V$**. For **gaseous** reaction **$\Delta H = \Delta U + \Delta ng \ RT$**.

6. Define an adiabatic process. Adiabatic process is defined as that one which does not exchange heat with its surroundings during the change from initial to final states of the system.

7. Define first law of thermodynamics.
"Energy may be converted from one form to another, but cannot be created or be destroyed"

8. What are the Characteristics of free energy(U)?
 (i) U is a state function. Its value depend on the initial and final states of the system.
(ii) U is an extensive property. Its magnitude depend on the quantity of material in the system.
(iii) U is not a path function..
   In S.I. system the unit of energy is Joules `J' or   kJ.

11.Differenciate Reversible and irreversible process

S.NO	Reversible process	IRReversible process
1.	It is a slow process	In this process speed
2.	A reversible process can be made	Irreversible process can take place in

	to proceed in forward or backward direction.	one direction only
3.	The driving force for the reversible process is small	There is a definite driving force required
4.	Work done in a reversible process is greater than the corresponding work done in irreversible process.	Work done in a irreversible process is always lower than the same kind of work done in a reversible process
5.	A reversible process can be brought back to the initial state without making an change in the adjacent surroundings.	An irreversible process cannot be brought back to its initial state without making a change in the surroundings

12.Differenciate Endothermic and Exothermic Reaction .

S.NO	Endothermic process	Exothermic process
1.	A process when transformed from initial to final states by **absorption of heat** is called as an endothermic process.	A process when transformed from initial to final states by **evolution of heat** is called as exothermic process
2.	The **final state of the system possesses higher energy** than the initial state	The **final state of the system possesses lower energy** than the initial state.
3.	Generally in a physical transformation which is endothermic **heat is supplied** to bring about the initial to final state. Example: melting of a solid	If the physical transformation is exothermic **heat is removed** to bring about the initial to final state. Example: Freezing of a liquid

<div align="center">13.CHEMICAL EQUILIBRIUM – I</div>

1.What are Reversible and Irreversible Reactions ?
Reversible Reaction :   A reaction which can go in the forward and backward direction
simultaneously under the same conditions, is called a **reversible reaction**.
Irreversible Reaction : In a reaction when the product molecules **never react to produce
back** the reactants, then such a reaction is called as **irreversible reaction**.

2.Why chemical equilibrium is **dynamic** equilibrium ?
    when the forward and reverse reactions take place **endlessly and simultaneously with equal
rates**. Therefore chemical equilibrium is called as dynamic equilibrium.

3.What are the Characteristics of Chemical Equilibrium.

(i) Constancy of concentrations .When a chemical equilibrium is established in a closed vessel at
constant temperature, the concentrations of various species like reactants and products remain
unchanged.
(ii) Equilibrium can be initiated from either side**.**
(iii) Equilibrium cannot be attained in an open vessel.
(iv) Catalyst does not alter the equilibrium.
(v) The value of equilibrium constant does not depend upon the initial
concentration of reactants.
(vi) At equilibrium, the free energy change is minimum or zero.

4.Write note on homogeneous equilibrium and Heterogeneous equilibrium ?
   In a chemical reaction existing in equilibrium, if all the **reactants and products** are present in
the same phase, then a **homogeneous** equilibrium.

In a chemical equilibrium, if the **reactants and products are in different phases** then **heterogeneous** equilibrium.

5.State Law of Mass action.
 "The rate of a chemical reaction is proportional to the active masses of the reactants". By the term `active mass', it is meant the molar concentration.

14.CHEMICAL KINETICS – I

1. Define half life period.
It is the time required to reduce the concentration of the reactant to half its initial value.

$$t_{1/2} = 0.693 / k$$

2. What is molecularity?
    Molecularity is defined as the number of atoms or molecules taking part in an elementary step leading to a chemical reaction.

3. What is a rate determining step? In a multistep reaction, the rate of a particular step is slower than the rest. i.e., the rate constant for this step will be lower than that of the rest of the steps. Such a step is known as slow step or rate determining step of the reaction.

5. Define the rate of a reaction.
 The rate of the reaction is defined as the change in the concentration of any reactant or product in the reaction per unit time. It tells, how fast or how slow a reaction could be.

6. What are factors influencing reaction rates
* Nature of reactants and products
* Temperature of the system
* Presence of catalyst
* Surface area of reactant

7. State rate law
The rate of reaction is proportional to the product of initial concentration of all the reactants with each. Concentration raised to certain exponential power
Rate $\propto$ $[A]^P [B]^q$
Rate   =   K $[A]^P [B]^q$
K is proportionality constant

8. Define order of the reaction**.**
Order of reaction is defind as the sum of exponential powers to which each concentration is raised in rate expression.
Rate :   =   K $[A]^P [B]^q$

15.Basic concepts of organic chemistry
1.Write short note on Clemmensen Reduction
Ketones can be reduced to their corresponding hydrocarbons by the mixture of Zn/Hg and conc. HCl.

$$C_6H_5COCH_3 \xrightarrow[HCl]{Zn/Hg} C_6H_5 - CH_2 - CH_3$$
acetophenone   Ethyl benzene
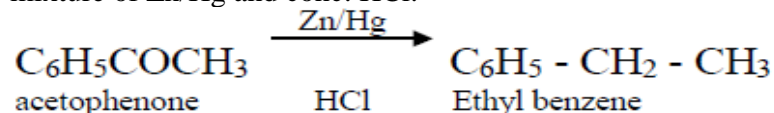
16.PURIFICATION OF ORGANIC COMPOUNDS

1.What is Sublimation ?
        Certain solid substances like Naphthalene or camphor when heated pass directly from solid to the vapour state without melting. The vapours when cooled give back the solid substance. This process is known as sublimation.

2. 3.

Difference between paper chromatography and thin layer chromatography

| Paper Chromatography	Thin Layer Chromatography
(i) Separation based on partition	Separation is based on partition, adsorption and ion exchange.
(ii) Stationary phase is the water molecules bound on the paper.	Stationary phase is a layer of silica gel or alumina on glass plate.

3. How many methods used for purification and separation of organic compounds ?

i) Crystallisation   ii) Fractional Crystallisation
iii) Sublimation   iv) Distillation
v) Extraction with solvents   vi) Chromatography

19.ORGANIC HALOGEN COMPOUNDS

1.What is Markovnikoff's rule :

It states that when a hydrogen halide is added to an unsymmetrical olefin, the negative part of it is added to the carbon that carries least number of hydrogens.
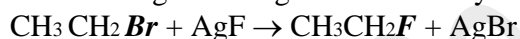
$$CH_3.CH = CH_2 + HCl \rightarrow CH_3\text{-} CH \text{-} CH_3$$
$$|$$
$$Cl$$
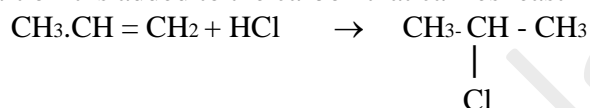
2.Hunsdiecker or Borodine - Hunsdiecker reaction

Silver carboxylates in carbon tetrachloride are decomposed by chlorine or bromine to form alkyl halide.

$$CH_3CH_2COO\ Ag + Br_2 \rightarrow CH_3CH_2Br + CO_2 + AgBr$$
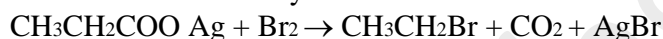
3.what is Finkelstein reaction .

The exchange of halogen between alkyl halide and sodium iodide occurs

$$CH_3\ CH_2\ \textbf{\textit{Br}} + AgF \rightarrow CH_3CH_2\textbf{\textit{F}} + AgBr$$
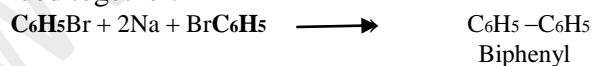
3. Explain the following reactions:

(i) **Wurtz-Fittig reaction :**

Aryl halides react with alkyl halides when heated with sodium in ether solution to form alkylbenzene.   ether
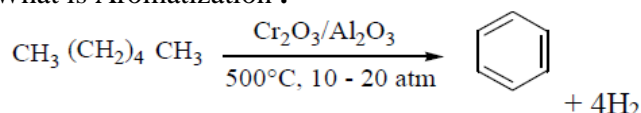
$$C_6H_5Br + 2Na + BrC_2H_5 \longrightarrow C_6H_5 -C_2H_5 \quad + \; 2\ NaBr$$

Ethyl benzene .
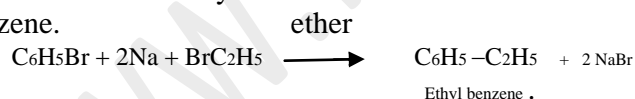
ii) Fittig reaction : In the absence of alkyl halides, aryl halides in ether solution react with sodium to give biaryl compounds in which two benzene rings are bonded together.
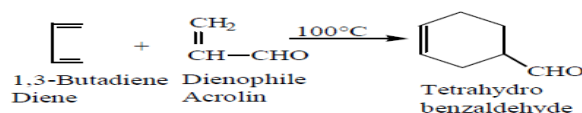
$$\textbf{C}_6\textbf{H}_5Br + 2Na + Br\textbf{C}_6\textbf{H}_5 \longrightarrow C_6H_5 -C_6H_5$$

Biphenyl

4. Write short note on **Wurtz reaction** .

$$CH_3CH_2\ Br + 2Na + Br - CH_2.CH_3 \rightarrow CH_3(CH_2)_2\ CH_3 + 2NaBr$$

5. What is Aromatization **.**

$$CH_3\ (CH_2)_4\ CH_3 \xrightarrow[500°C,\ 10 - 20\ atm]{Cr_2O_3/Al_2O_3} \text{⬡} + 4H_2$$

6.Write short note on Diels - Alder reaction .

1,3-Butadiene Diene   Dienophile Acrolin   Tetrahydro benzaldehyde

SOME FIVE MARK QUESTION AND ANSWERS

1.Explain Froth flotation process .

* This method is suitable for sulphide ores like zinc blende (ZnS), and copper pyrites ($CuFeS_2$).

* In this process, the powdered ore is mixed with water and a little pine oil.

* The whole mixture is then stirred vigorously by blowing compressed
  air. The oil forms a foam (or froth) with air.

* The ore particles stick to the froth, which rises to the surface; while the rocky, and earthy impurities (gangue) are left in water.

* The froth is skimmed off, collected, and allowed to subside to get concentrated ore.
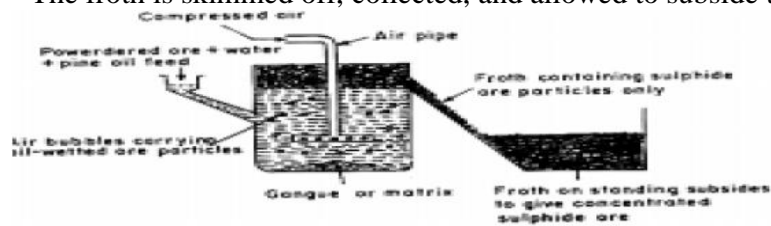
2.Explain Electromagnetic separation process.

*This method is meant for separating **magnetic impurities from nonmagnetic ore particles,** e.g., tinstone (a tin ore)

*The powdered ore (containing the associated magnetic impurities) is made to fall (from a hopper) on a belt moving over electromagnetic roller.

*The magnetic impurities fall from the belt in a heap near the magnet, due to attraction; while the non-magnetic concentrated ore falls in separate heap, away from the magnet, due to the influence of centrifugal force.
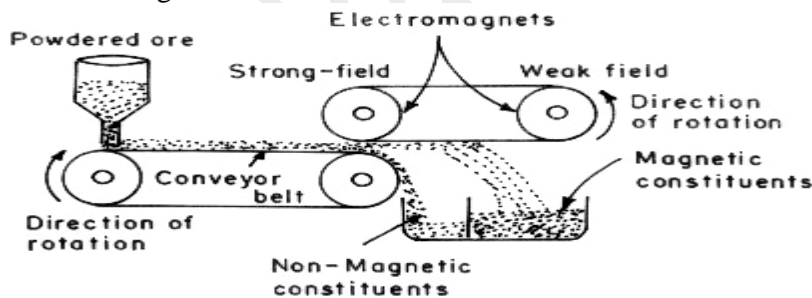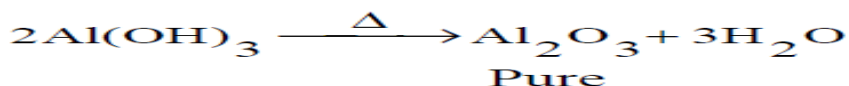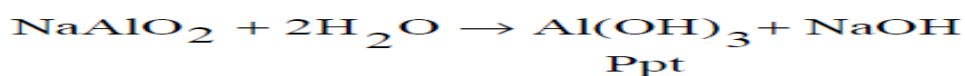

Fig. 3·3·2 Electromagnetic separation method

3. Explain how the impurities of ore removed by Chemical method .

*This method is employed in case where the ore is to be in a very pureform, e.g., aluminium extraction. Bauxite (Al_2O_3), an ore of aluminium, contains SiO_2 and Fe_2O_3 as impurities.

* When bauxite ore is treated with NaOH, the Al_2O_3 goes into solution as sodium meta aluminate

*leaving behind the undissolved impurities [Fe_2O_3, SiO_2, $Fe(OH)_3$,etc.], which are then filtered off.

$$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$$
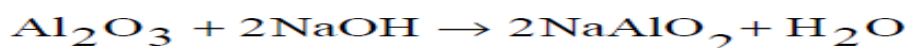
Sod. meta. aluminate
(In solution form)

$$NaAlO_2 + 2H_2O \rightarrow Al(OH)_3 + NaOH$$
Ppt

$$2Al(OH)_3 \xrightarrow{\Delta} Al_2O_3 + 3H_2O$$
Pure

**4.Explain Bessemerisation processes.**

* It is the process used for the manufacture of steel from pig iron.

* The principle : cold air blowed through refractory lined vessel known as converter containing molten pig iron at about 2 atmospheric pressure, oxidizing the impurities and simultaneously converting pig iron to steel.

5. What is Zone refining . Explain the process.

*This method is employed for preparing highly pure metal (such as silicon, tellurium, germanium), which are used as semiconductors.

* principle : melting point of a substance is lowered by the presence of impurities. Consequently, when an impure molten metal is cooled, crystals of the pure metal are solidified, and the impurities remain behind the remaining metal.
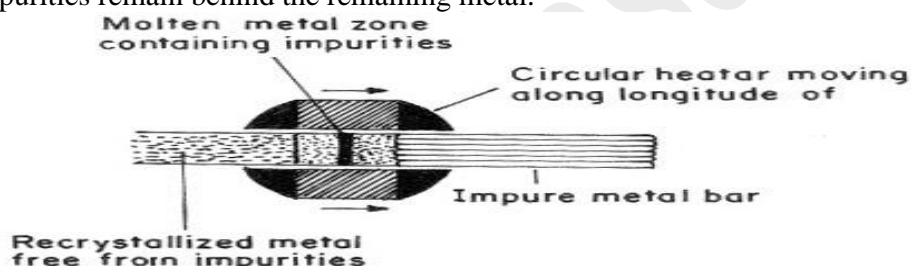
6.Explain the various type of quantum numbers ?
* Quantum Numbers
       The quantum numbers are required to locate an electron in an atom
i). **The principal quantum number (n) :** n identifies the shell, determines the size of the orbital and also to a large extent the energy of the orbit.
ii) **Azimuthal quantum number (l).** There are n subshells in the nth shell. l identifies the subshell and determines the shape of the orbital.
There are ($2l+1$) orbitals of each type in a subshell i.e.,   one s orbital ($l=0$), three p orbitals ($l=1$), and five d orbitals ($l=2$) per subshell. To some extent l also determines the energy of the orbital in a multi-electron atom.
if n=1, $l=0$ only one value (one level only) s level.
n=2, $l=0$ and 1 (2 values or 2 sub- levels) s and p level.
n=3, $l=0$, 1 and 2 (3 values or 3 sub-levels) s, p and d level.
n=4, $l=0$, 1, 2 and 3 (4 values or 4 sub-levels) s, p, d and f level.

iii). **Magnetic quantum number (m):** m designates the orientation of the orbital. For a given value of l, m has ($2l+1$) values, the same as the number of orbitals per subshell.

*The values are -'l' through zero to +'l' and   thus there are ($2l+1$) values.

when l=0, m= 0 (only one value or one orbital)
l=1, m= -1, 0, +1 (3 values or 3 orbitals)
l=2, m= -2, -1, 0, +1, +2 (5 values or 5 orbitals)
l=3, m= -3,-2, -1, 0, +1, +2, +3 (7 values or 7 orbitals).

iv) **Spin quantum number (*s*)**. m_s refers to orientation of the spin of the electron.

7. **Explain Factors Influencing Ionization Enthalpy.(ionisation potential)**

The ionization enthalpy of an atom depends on the following factors.
(i) Size of the atom.
   Ionization enthalpy **decreases with increases in atomic size**
(ii) Charge on the nucleus.
 Ionization enthalpy **increases with increase in nuclear charge**
(iii) Screening effect of inner electrons.
Ionization enthalpy **decreases when the shielding effect of inner electrons increases.**
(iv) Penetration effect of electrons
The penetration power of the electrons in various orbitals decreases in a given shell (same value
of n) in the order: **s > p > d > f**.
(v) Effect of half-filled and completely filled sub-levels
If an atom has half-filled or completely filled sub-levels, its **ionization enthalpy is higher** .

8.**Explain Factors influencing the magnitude of electron affinity.**

 (i) *Atomic size*;
(ii) *Effective nuclear charge*; and
 (iii) *Screening effect by inner electrons*.

   Electron affinity -- **Decrease** on moving down the **group**.
                            Increase as we move across a **period** from left to right.

9. Mention the Characteristics of organic compounds.

All organic compounds have the following characteristic properties
(i) Many organic compounds are inflammable

(ii) They are mostly covalent compounds

(iii) They are generally soluble in non - polar solvents like carbon tetrachloride, benzene etc.

(iv) They have generally low boiling point and melting point.

(v) They exhibit isomerism .

10. **What is Homologous series.Mention the Characteristics of homologous series.**

       A group or class of organic compounds related to each other by a general molecular
formula contributes homologous series.

Homologous series have the following characteristics :

(1) All members of a series contain same elements and the same functional groups.

(2) All the members of a homologous series can be represented by a general formula
Examples
Alkanes C_nH_{2n+2} Alkenes C_nH_{2n} Alkynes C_nH_{2n-2}

(3) All the members of a homologous series can be prepared by similar methods.

(4) All members of a homologous series usually undergo similar chemical reactions.

(5) Successive members in a series differ by a -CH_2 group

(6) The physical properties of the members of a homologous series vary in a regular way down the series. For example, boiling point, melting point and density of the alkane series vary in a regular way with increasing number of carbon atoms.

11.What is Functional groups.Give examples .

The chemical properties of all the members of a homologous series are characterised by a group called the functional group. It is characteristic of a particular series.
The following table gives a list of functional groups and names.

Halide   – X   Alcohol   – OH   Aldehyde - CHO

Ether   – O   Amine   – NH_2 Nitro compounds   – NO_2

12.Differenciate between electrophiles and nucleophiles

S. No.	Electrophiles	Nucleophiles
1.	are electron deficient	are electron rich
2.	are cations	are often anions
3.	are Lewis acids	are Lewis bases
4.	accept an electron pair	donate an electron pair
5.	attack on electron rich sites	attack on electron deficient sites
6.	possess an empty orbital to house the lone pair from the nucleophiles	possess a minimum of one lone pair of electron.

TRAVEL TO WIN !

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